

SHOCK.

E. MORRIS. M.D. F.R.C.S. (EXAM)





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Benjamin Leashington

A PRACTICAL TREATISE ON

SHOCK

AFTER SURGICAL OPERATIONS AND INJURIES:

WITH ESPECIAL REFERENCE TO SHOCK CAUSED BY

RAILWAY ACCIDENTS.

BY

EDWIN MORRIS, M.D., F.R.C.S. (EXAM.)

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Vide MEDICAL TIMES AND GAZETTE, 1853.

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TO

SYDNEY JONES,

M.B. LOND., F.R.C.S.

ONE OF THE SURGICAL STAFF, LECTURER ON DESCRIPTIVE AND
SURGICAL ANATOMY AND ON OPHTHALMIC SURGERY
AT SAINT THOMAS'S HOSPITAL, LONDON.

DEAR SIR,

This Treatise is inscribed in admiration of your learning and exquisite professional skill, which have raised you to the elevated station which you now occupy; and as a memorial of my gratitude for valuable professional services rendered to me when suffering from a severe injury to the hand, the preservation of which is entirely due, under Providence, to your untiring attention and skill shown on that occasion: thus placing under a lifelong obligation

Yours sincerely,

EDWIN MORRIS.

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PREFACE.

IN SUBMITTING this Treatise to the Medical Profession, I would observe, that the materials of which it is composed were collected and arranged during the few leisure hours I could command from the time necessarily devoted to a laborious, general Practice.

The subject of 'Shock' is so comprehensive, that my humble efforts can be considered as little more than opening the way to future inquiries. I hope, however, at no distant period, to be able to treat it more fully, after further researches into the matter. Indulgence may fairly be claimed by one, who, during great mental exertion and fatigue, spares time to record the result of the experience of six-and-twenty years: on a subject, too, which has been so little understood. The Chapter 'on Shock from Railway Injuries,' has been written with a view to assist in unravelling those intricate cases in which

there is every reason to believe the symptoms are simulated, and at the same time to put medical men on their guard against such cases.

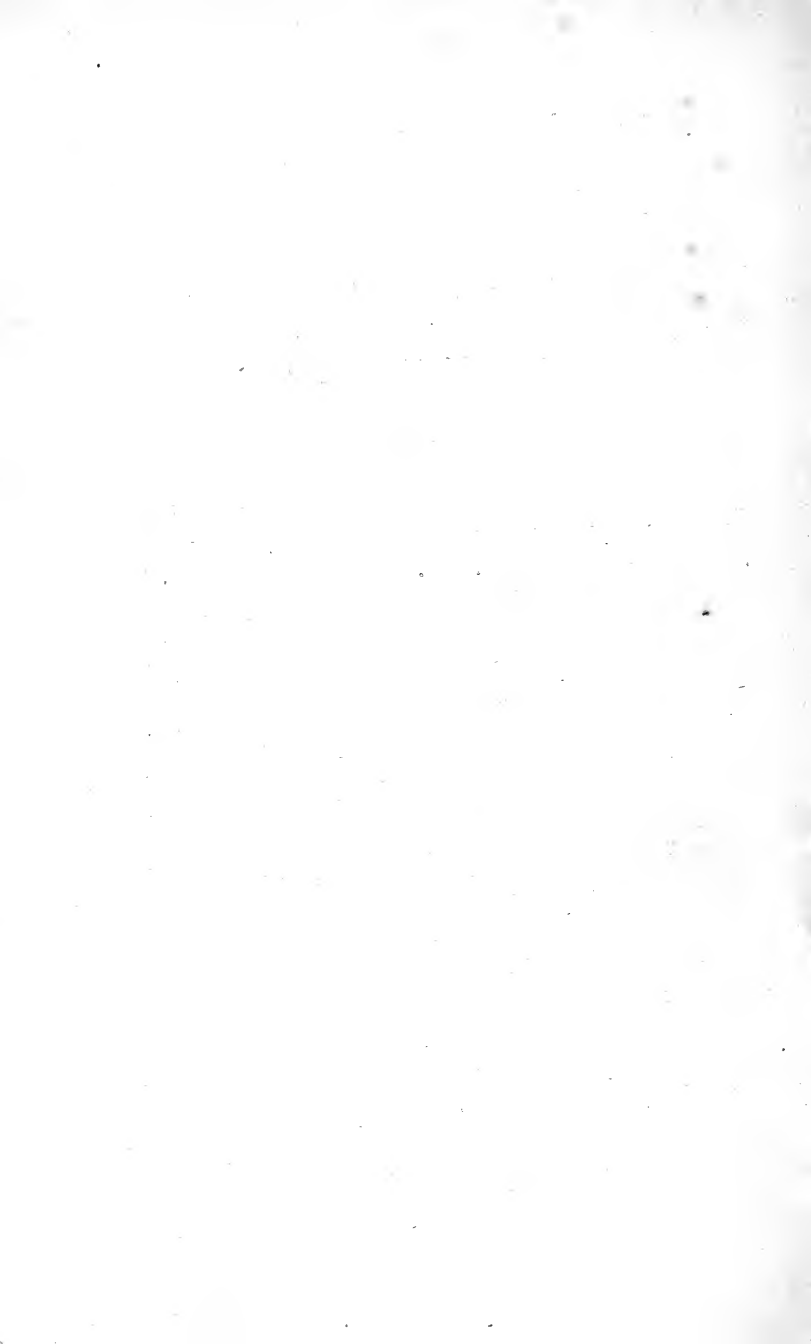
Imperfect as this Treatise may be, I cannot conclude without expressing a hope that it may be found worthy of the commendation of the Medical Profession, which I should highly value, and which would more than repay me for the time and labour bestowed upon it.

E. M.

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SHOCK.*

Synonyms of Shock.

SUDDEN VITAL DEPRESSION: GREAT NERVOUS DEPRESSION: FINAL
SINKING OF VITALITY: NERVOUS SHOCK: VIOLENT MENTAL EMOTION.

GENERAL OBSERVATIONS ON SHOCK.

By the word *shock* we understand that peculiar effect on the animal system, produced by violent injuries from any cause, or from violent mental emotions—such as grief, fear, horror or disgust. *Shock*, in a surgical sense, involves much that is interesting to the practical surgeon, and demands his most serious consideration. In the whole range of surgical literature but little notice has hitherto been taken of this subject, and then only incidentally.

After a diligent search amongst early surgical writers, the earliest record that I can find of *shock*

* From the Teuton language: a blow.

is in a treatise 'on Gun-shot Wounds.'* The writer says that the sufferer may have time to recover from the *shock* of 'the injury' and recommends that the operation should be postponed until the '*alarm and shock*' the patient has sustained from the injury has *subsided*. Again, Mr. Guthrie states, 'Soldiers in general are anxious to undergo an operation when they find it inevitable, and frequently press it before the proper time, that is, before they have sufficiently recovered from the *shock* of the injury. When the blow is severe, as by a cannon shot or shell, a peculiar constitutional alarm ensues in a much greater degree than would follow an injury of equal magnitude precisely in the same spot, from any other cause. It affects alike, although not in an equal manner, the coward and the brave, the man of learning and the unlettered soldier. As it is, however, an affection often greatly augmented from an association of ideas, so is it more immediately controlled by men of sound judgment or command of mind, and is more certainly removed by the knowledge of the injury being of little consequence.' Another writer on military surgery* states: 'The propriety of amputating on the field being admitted, while hundreds are waiting for the decision of the surgeon, he will never be at a loss to select individuals who can safely and advantageously bear to be operated on; but he will

* Guthrie on Gun-shot Wounds.

† Hennan's Principles of Military Surgery, 1818.

betray a miserable want of science indeed, if he indiscriminately amputates the weak, the terrified, the sinking, and the determined.' Again he says, 'The only medical officer who mentions this occurrence (i.e. shock) is the surgeon of the Impregnable: he merely states 'that he did not amputate till the battle had terminated, and that it appeared to him the constitution of his patients had entirely recovered from the *shock* and *alarm* usually experienced on being wounded in battle.' Mr. Travers,* in his excellent work, has certainly given us the key to the whole subject of shock, under the head of 'Constitutional Irritation,' and I feel that I am under great obligations to Mr. Travers for many valuable hints and suggestions, in the composition of this treatise. He was remarkable for the soundness of his surgical knowledge, and the clearness with which he expresses his ideas as a pathologist. S. Cooper has made slight allusion to this subject in his excellent 'Surgical Dictionary,' in the articles on 'Gun-shot Wounds' and 'Injuries of the Head.' † The first writer to whom we are indebted for a succinct account of *shock* is Dr. Copland,‡ whose observations are of great practical value. He says, 'I have treated of *shock* in this work, because I consider it a most important and

* Travers' Inquiry concerning Constitutional Irritation, 1827.

† S. Cooper's Surgical Dictionary, 1838.

‡ Copland's Medical Dictionary, 1858.

dangerous affection, implicating more or less the whole vital and animal functions, and hence coming strictly within the province of the physician, as well as within that of the surgeon. When we consider that, of the numerous accidents and wounds which cause death, the greater proportion produce this effect by the severity and suddenness of the shock to the vitality of the frame, rather than by any interruption to the functions of the injured part, the interest of this subject will appear in its true light.' With the exception of Dr. Copland, the several authors before mentioned have given but an ambiguous, vague, and undefined statement respecting *shock*, and enter into no details, or characteristics of *shock*, so that we may fairly assume that they had paid no particular attention to the subject.

Of modern surgeons, the only person I know who has written upon the subject of *shock* is Mr. Paget, of Saint Bartholomew, who has devoted to it a considerable portion of his address on Surgery delivered before the members of the British Medical Association in London, August 1862;* a very valuable production, worthy of so eminent and distinguished a surgeon. We have here for the first time some well defined rules laid down for the management of *shock*, and the re-action after *shock*; but of this I shall speak more fully hereafter. Notwithstanding so little

* British Medical Journal, p. 156, 1862.

notice has been taken of *shock*, still it is a term frequently made use of, not only by medical men but by the public. Dr. Buzzard* gives the history of three cases under the head of 'Shock to the Nervous System,' in which compensation was sought for injuries received to the 'nervous system' from a Railway Company, and in each case it was awarded.

An interesting case is given under the head of 'An Anomalous Case' in 'British Medical Journal,' 1862, p. 633, by Mr. Harrison. It is the case of a man who died three days after severe injury: he had just recovered from a broken leg, at the moment of his second injury: he 'received a terrible *shock*, both mental and physical.' The question is, whether he died simply by *shock*, or pyæmia, remembering that *shock* would probably modify the symptoms, but certainly accelerate the termination of putrid infection. . . . Soon after death the heart was examined, also the brain; nothing abnormal was found, &c. Thus it would seem that *shock* and putrid infection, meet hounds of death, hunted this unfortunate man, as it were, in couples: *shock* held him down while pyæmia fastened in her poisoned fangs; and so while

Presently through all his veins ran
A cold and drowsy humour, which did seize
Each vital spirit,

* Lancet, p. 443, 1865.

shock, like a dog, still held on, till the great killer cried 'Dead.' Again, Mr. Cadge,* of Norwich, says: 'The disease commences in a system which we would consider able to sustain the *shock* of operation.' 'He had not fully recovered from the first *shock* and loss of blood: why be in a hurry to add a second *shock*?' 'It may be that he has suffered so little from the first injury, that he can well bear the additional *shock* of amputation.'

Mr. Price† states, 'Where the local suffering has not been so great or prolonged, the constitution feels the *shock* of an operation more acutely, and a patient in moderately good health will succumb quickly.'

It has been objected that patients who have long suffered from chronic disease are incapable of withstanding the *shock* of a severe operation.

In reply to this, Mr. Price refers to the histories of some successful cases in evidence that, 'Provided the operation be skilfully performed, and the after management judiciously carried on, the result often surpasses the most hopeful expectation of the surgeon.'

'We are sorry to hear that the patient from whom Mr. Spencer Wells removed the enlarged spleen died,

* On Amputation in Gangrene, by W. Cadge, Esq. British Medical Journal, p. 495, 1865.

† Price on Excision of Knee-joint, p. 145, edited by H. Smith.

on the seventh day after the operation, of pyæmia. He had quite got over the *shock* of the operation.’*

The above are fair examples of the manner in which *shock* is alluded to by surgical writers generally, in the present day: no explanation, no detail of what *shock* is, and the reader is left to draw his own conclusion, and form his own opinion relative to the condition of the system meant by the mystical term *shock*.

How frequently do medical men in their evidence before a coroner’s jury use the word *shock*, as—‘He never recovered the *shock* of the fall;’ ‘He never rallied from the *shock* of the operation;’ ‘I attribute her death to the great *shock* she sustained on hearing the news of her husband being killed;’ &c. Such is the mode in which medical men deal with the word *shock* on such occasions, and which I have copied from the newspapers of the day; and how often do we meet with such paragraphs as the following: ‘He was immediately conveyed to the county hospital, but the injuries were so great, coupled with the *shock* to the system, that notwithstanding he was a very powerful man, he died.’ In the case of *Denham v. Great Northern Railway Directors*, the evidence consisted principally of medical witnesses, who said the plaintiff was suffering from a general prostration of the system from the *shock* he had sustained:

* British Medical Journal, p. 591, 1865.

damages 4,720*l.* was awarded—reported in ‘Daily Telegraph,’ Dec. 27, 1865. Again, ‘The horror produced (by the assassination of President Lincoln) in London was universal; you could see in men’s faces, as you traversed the crowded streets, a reflection of the *shock*.’*

Shock from mental causes has a very powerful effect upon the human frame. ‘A lady who was deeply *shocked* on receiving the intelligence of a great change in her worldly condition, and who had a remarkable quantity of dark hair, found on the following morning that the whole of her hair had become of a silver white.’

‘My hair turned white
In a single night,
Like some have done
With sudden fears.’—BYRON.

Several historical writers have recorded instances of the severity of mental *shock*. ‘I was struck,’ says Madame Campan, ‘with the astonishing change misfortune had brought upon Marie Antoinette’s features; even her hair had turned almost *white* during her transit from Varennes to Paris.’ ‘The Duchess of Luxemburg was caught making her escape during the horrors of the French Revolution, and put in prison: the next morning it was observed that her hair had become *white*.’

* Leader, Daily Telegraph, Dec. 4th, 1865.

‘A practical joke was played upon a brave Spanish officer of the Duke of Alva’s camp, to try his courage. The provost marshal, with a guard and a confessor, awoke him in the night from his sleep, stating that he had an order for his immediate execution. He confessed, said he was prepared to die, but declared his innocence. The provost marshal laughed, and said it was only a joke. With a ghastly paleness, he ordered the provost out of the tent, saying that he had “done him an evil office,” and the next morning, to the wonder of the whole army, the hair of his head, from a deep *black* colour, had become perfectly *white*.’

It will now be my duty to endeavour to show what is meant by *shock*, whether the result of severe injuries or following surgical operations. The phenomena of shock are mostly observed through the medium of the nervous system, acting indirectly upon the great nervous centre, the brain itself—which may have its functions suspended, delirium ensue, and if central disturbance has been very great, convulsions may come on, followed by coma, and death may happen. In such a case the involuntary muscles of respiration and of the heart have in all probability become suddenly arrested. We are well aware of the intimate connection of the heart and brain, and how much the brain is influenced by the blood; in fact, it is the blood that forms the living link between the brain

and the heart: the activity of the brain is dependent on the supply of blood from the heart; the brain could not perform its normal part without the blood any more than the heart could beat without the brain.

The brain has an immense influence over the heart's action; this is well illustrated by the nervous trembling which accompanies fear, also during the temporary disturbance of the heart's action. When a person faints, the functions of the brain are entirely suspended, showing its dependence upon the heart for its due supply of blood, which is necessary for the proper performance of its natural functions. Any great mental disturbance will powerfully affect the action of the heart: we can readily understand that the one powerfully affects the other in producing that depressed condition of the nervous system called *shock*. Whatever power the brain may have over the heart's action, there is no question but that the heart has a much more powerful influence over the brain and nervous system.

A fatal shock does not, however, frequently occur. Mr. Paget * says. 'The mortality from mere *shock* is very small, yet such deaths do happen, and it is desirable—though, perhaps, scarcely possible—so to analyse each instance of a fatal shock as to attribute its just share to each of the conditions on which it has depended, or which have contributed to it.'

* Paget's Address, British Medical Journal, p. 156, 1862.

This is perfectly true, for there are so many circumstances combining to produce shock, such as hæmorrhage, which very much aggravates the effects of shock, and in itself is adequate to produce great prostration, attended with convulsions, and will sometimes leave the patient in such an exhausted state that he cannot bear up against the shock of an operation. We cannot be surprised at this if we take a general survey of the vital phenomena, in the whole of its general relations and mutual connections, in the human frame: in the whole range of structural anatomy there is no part so difficult as the brain and nerves to comprehend. Of the active principle in the nervous system, we in reality know little or nothing; this, however, is a matter of no importance to us, and I only allude to it, in consequence of the important part it plays in the production of the train of symptoms called shock.

I am inclined to think that it is of the same nature as electricity, and the nerves act as conductors. Faraday has propounded this idea,* and Abernethy also advocated this doctrine; certain it is that this nervous agent has an action of a peculiar kind, and if not identical with electricity, is very analogous to it.

The brain and spinal cord, the very centre of this nervous power, is the medium through which the animal system receives powerful impressions pro-

* On the Electrical Eel in the Philos. Trans., 1839.

duced by mental or physical causes ; and to understand *shock* and its consequences, it is absolutely necessary that we should have a thorough knowledge of the physical properties and functions of the nerves themselves.

To go, however, into this subject as I could wish, would involve the taking up of more space than is desirable in this work.

To illustrate the peculiar sensibility of the nervous system, I would refer the reader to the remarkable phenomena produced by the electrical machine; a *shock* which is felt throughout the nerves, spinal cord, and brain ; and should the electrical spark be of a powerful character, the nerves become stunned, nay, their action destroyed, producing paralysis ; such is the complicated and delicate machinery through which mechanical injuries exert their baneful effects upon the animal body. Dr. Livingstone,* to show the effects of *shock* upon wild animals, says : ‘ To show that a *shock* on the part of the system to which much nervous force is at the time directed, will destroy life, it may be mentioned that an eland, when hunted, can be dispatched by a wound which does little more than injure the muscular system : its whole nervous force is then imbuing the organs of motion, and a giraffe, when pressed hard by a good horse only two or three hundred yards,

* Missionary Travels, by Dr. Livingstone, 1857.

has been known to drop down dead, without any wound being inflicted at all. A full gallop by an eland or giraffe quite dissipates its power, and the hunters, aware of this, always try to press them at once to it, knowing that they have but a short space to run before the animals are in their power. When the nervous force is entire, terrible wounds may be inflicted without killing: a tschesebok having been shot through the neck while quietly feeding, we went to him, and one of the men cut his throat deep enough to bleed him largely; he started up after this, and ran more than a mile and would have got clear off, had not a dog brought him to bay under a tree, where we found him standing.'

No wonder, therefore, that Mr. Hunter should make the following observations: 'I have seen a man die almost immediately upon the loss of a testicle. I have seen convulsions immediately attend the operation for the hydrocele, so that I have almost despaired of recovery.' The loss of a limb is more than many can bear. 'It would seem as if simple irritation in a part was capable of affecting the whole of the nervous system; a sudden alteration, a sudden call, or a sudden and universal irritation upon the constitution will, I imagine, produce immediate weakness; for every new action in a constitution must produce or tend to produce a weakness in that function; the effects of which will vary according to

the necessity and state of the constitution. There are, sometimes, constitutional symptoms or universal sympathies, which arise immediately out of the act of violence itself, and which are often dangerous. Loss of blood may be reckoned one cause which will bring on all kinds of constitutional weakness, or violence alone, which will, without loss of blood, produce immediate fatal effects.’ *

Sir Astley Cooper says: ‘The most severe injuries, by *shock* to the nervous system, cause death without re-action,’ † and he gives two cases, one of a crushed knee, and the other of a scald of the lower extremities, fatal in eight hours. ‘The sensorial power may be so impressed as instantly to destroy all its functions.’ ‡

We have cause to suppose that certain impressions and actions are harmoniously kept up between the muscular and nervous systems, and that any sudden suppressions or interference with them will have the effect of producing a violent or sudden *shock*, physical or mental, or both, in proportion to the magnitude of the injury or emotion producing it. Fear and grief are great depressing passions; the effects will, however, vary according to the condition

* Treatise on the Blood and Inflammation, &c., by John Hunter, 1812.

† Lectures on the Principles and Practice of Surgery, sect. 1, by F. Tyrrell.

‡ Enquiry into the Laws of the Vital Functions, by Dr. Wilson Philip.

of the person, and that which immediately causes it. Sir Walter Scott states (after the death of Lady Scott), 'I do not know what other folks feel, but with me the hysteric passion, that impels tears, is a terrible violence, a sort of throttling sensation, then succeeded by a state of dreaming stupidity, in which I ask if my poor Charlotte can actually be dead.'

The *shock* produced by terror is of a more violent nature than that caused by grief. When concussion of the brain is spoken of, we mean neither more or less than that the brain has received a *shock* which has materially interfered with its circulation, so as to suddenly suspend the powers of the mind with more or less severity, and this has occasionally been followed by most remarkable changes, which have gone on increasing in intensity, until absolute insanity has been established. When we say that a person is stunned, the brain has received a severe *shock* or impression, which has for a time interfered with or disturbed its circulation. Patients have been known to die under such circumstances, and at a post-mortem examination the brain was found not to have sustained the slightest injury. When the brain has been violently shaken, and the *shock* is unusually severe, no reaction takes place—the heart ceases to beat and the patient expires: under these circumstances, Sir B. Brodie believes that death is to be attributed to the disturbed condition of the heart.

It appears to me that the cause of death is a functional disturbance of the brain, which deprives it of the power of its natural action and influence over the circulating system. The action of the heart is impaired, and respiration as a necessity becomes interrupted, and coma prevails in all cases where re-action fails. The most prominent symptom present indicative of the intense *shock* the brain may have sustained, is an unmanageable sickness, and this is not only a necessary consequence, but the great cause of the extreme nervous depression. Sir Astley Cooper says: 'When a part of the body receives an injury, the nerves convey a knowledge of it to the important organs, as the spinal marrow, brain, heart, stomach, &c.'* The study and contemplation of the special influence of the nervous system over the whole muscular structure of the animal body, more especially over the heart, is most interesting and important, and the joint labours of Bicket, Brodie, Cuvier, Majendie, Bell, and Mayo have placed at our disposal a mass of information of a most valuable kind, and which materially assists us at the present day in clearly understanding the physiology of *shock* and its consequences. Many and valuable physiological researches have been conducted during the past few years, for the purpose of showing the

* Sir A. Cooper's Lectures, sect. 1, by F. Tyrrell.

peculiar and special influence the brain and nervous system have over the functions of the several parts the nerves supply, more especially over the heart and circulation, and which has afforded us most valuable information on one of the most difficult subjects in the whole range of physiology.

For instance, in cases of sudden death following injury, when no post mortem appearances have revealed any mischief of the vital organs, and no other cause of death could be assigned, except that of annihilation of the nervous influence on the heart's action, which was necessary for the due performance of its normal functions.

The general distribution of the nerves over the whole body, and the general sympathy, must be remembered in the consideration of these cases. Although we can amputate a limb, and thus completely divide the nerves with safety, yet any injury which may be received and which partially divides the nerves, will be productive of great mischief, by creating a great amount of irritation of the whole nervous system.

Death will occasionally take place most suddenly after injuries and operations without their being attributable to the lesion of any important organ, and the morbid phenomena which are produced are clearly due to an unusual disturbance of the brain and nervous system. Under such circumstances, how is



death produced? Unquestionably, the heart itself is powerfully acted upon, inasmuch as we have diminished action thereof, paleness, a weak pulse and great prostration; in fact, everything denotes diminished nervous power, the withdrawal of which from the heart itself renders it incapable of continuing its muscular action.

When a nerve is irritated by a blow, wound, or puncture, acute sensation is roused up and pain is produced, which may induce muscular spasm or contractions. If the blow or injury given to the nerve is very great, it loses its normal function, and is no longer capable of transmitting sensation or motion, and the part to which it is distributed becomes useless.

Thus, in severe concussion of the brain, without lesion of its substance, there is a shock or violence done to the whole nervous organ, which has locked up, as it were, its functions, and which, if not speedily restored, results in the complete annihilation of the muscular power of the heart. Thus it is that lightning destroys by its excessive force upon the nervous substance, and stops the nervous influence at once. The same may be said of the shocks produced by large galvanic batteries and electrical machines.

In inflammatory affections, the pain is mainly due to the pressure of the over distended blood-vessels upon the nervous fibrillæ; unquestionably, a proper

state of stimulation is kept up in the body by the circulation, and, in fact, is absolutely necessary to the normal action of the nervous system.

The loss of blood has a powerful effect upon the brain and the whole system of nerves, producing sometimes syncope, shivering, headache, convulsions, paralysis, insanity, &c. Nerves may become paralysed by being stimulated too much; or by a state of excitement being continued too long, exhaustion of the nervous susceptibility may ensue. Men overworked, or animals over driven, will ultimately succumb and lie down and die, being deprived of all nervous power, which would enable them to make further effort.

Blows given in the region of the stomach have a powerful effect in producing *shock* through the medium of the solar-plexus, and will often prove fatal. Sir Astley Cooper* relates several instances.

‘A man walking through Fleet Street one day, happened to quarrel with a woman, when another came up, and gave him a blow in the region of the stomach, which caused almost instantaneous death. On dissection, no cause could be found to account for his sudden death. A man belonging to the India-House was attempting to lift a weight, when another came up and jocosely said, “Here,

* Sir A. Cooper’s Lectures on Surgery, 1830, p. 9.

stand on one side, and let an able man attempt it!" and at the same time gave him a slight blow on the stomach, when the poor fellow dropped down and expired. His body, upon being opened, showed no marks of violence.'

When an injury of any kind is inflicted upon any part of the body, every part of the system is affected by it, through the medium of the nervous system, more especially the more important organs of the body, such as the heart, stomach, and spinal marrow, which effect will be in proportion to the extent and nature of the injury.

No one will deny, in fact no experiment has been advanced to deny, the great fact, that the brain holds supremacy over all the normal conditions of life. We need not therefore be surprised, that any sudden disturbance of the function of so important an organ should be attended with such dire results.

How often do we hear of sudden deaths, following accidents where not the slightest disturbance or injury of the animal structure could be detected, and in which death could not be attributed to any other cause except the complete destruction of the great nervous power! Cases are narrated of patients dying just before the commencement of an operation, and others, again, who have suddenly died during, or just after, an operation; and I am of opinion that no other solution of these fatal cases can be given,

excepting that the *shock* through the medium of the brain is such as to suspend the faculties of sense and volition, and to act directly upon the heart as a powerful sedative, producing a prostration of the nervous system so complete, that its influence upon the heart's action is such as to effectually prevent it from resuming its natural action.

Who has not heard of men who have been fighting, the one striking the other upon the stomach, who have immediately dropped down dead; and yet a post mortem examination has revealed no physical injury? Dr. Barnes* relates a case of *sudden death during labour*, that of a primiparamamiacal excitement coming on during the dilatation of the cervix. Chloroform was given to induce moderate anæsthesia, so as to facilitate the application of the forceps. Gentle traction aided by uterine contraction effected delivery in half-an-hour. The placenta was cast. The patient maintained a good pulse. She spoke deliriously at times, but also rationally afterwards. Death occurred almost suddenly ten hours after delivery. Dr. Barnes did not think death was owing to the chloroform, but was disposed to attribute it to the *nervous shock*, which was manifested before the chloroform was given.

No cases illustrate so well the fearful effects of shock upon the system as those of burns. Ann S—, æt.

* British Medical Journal, 1866, p. 345.

9 years, was extensively burnt about the face, neck and chest; the cuticle was destroyed upon the chest, the lower extremities were cold; she was pulseless at the wrists, the breathing was hurried, she was much swollen about the throat, and had great difficulty in swallowing. A full dose of morphia was given, every effort was made to restore the depressed condition of the nervous system, but without effect, and she died six hours after the accident.

Mrs. Maltby, æt. 30 years, the mother of three children, accidentally set herself on fire when removing the kettle. She was very much burnt about the chest and arms, before the flames were extinguished. I saw her about one hour after; she had no pain, and described to me how the accident occurred; she was cold, and her pulse could not be felt; she had a severe rigor whilst I was talking to her, and afterwards she vomited up some brandy-and-water which had been given her, and which she said 'had made her sick;' the lime-water liniment was applied warm, and a grain of opium given. She expressed great alarm, fearing that she should die; three hours afterwards, she became a little confused in her ideas, and only answered after repeated questioning. She expired the next day, without having shown the least sign of re-action, and her death was clearly to be attributed to the depressed state of the nervous system, from the sudden shock and alarm of the accident.

If it were necessary, I could give many cases of severe *shock* following burns and scalds, which were successfully treated. I have also seen recoveries from shock after burns terminate fatally from extensive sloughing of the injured part some time after the accident. It is rather remarkable, that a small amount of injury from a burn will sometimes produce a fatal shock, even in the strong and healthy; others, again, having youth on their side, and great constitutional power will recover from the most severe form of nervous prostrations. How is this? Is it the temperament or constitution of the individual? Experience teaches us that such is not the case, inasmuch as the feeble and the strong appear to share about the same fate. One thing is certain; when shock has taken place, it is not influenced or modified by condition of the individual, so far as my experience goes.

It is these sudden collapses of vitality, attributable to no apparent pathological changes in the animal structure, which involve the whole subject of *shock* in so much mystery. Experimental inquiry into the specific influence which the nerves have over the heart's action, have resulted in some degree in accounting for its sudden cessation following violent injuries, or great mental emotion.

The stimulus of the nervous system is essential for the continued action of the heart, and any excess of stimuli applied to the involuntary muscles of the

heart, acts as a powerful sedative and paralyses its muscular fibres, and suddenly arrests its action.

In no other way can I account for the sudden destruction of human life, by a violent disturbance of the nervous system. Deaths resulting suddenly from injuries, or surgical operations, are clearly attributable to the withdrawal of the nervous influence from the heart itself. In fact, it is a *shock* or violence to the whole nervous system, producing great prostration of nervous power, prolonged until it is incapable of relieving itself; the heart losing its normal stimulant, becomes weaker in its action, until it ultimately ceases to beat altogether.

Bodily pain contributes most freely to the production of *shock*, and speedily leads to the fatal results which frequently happen after rupture of the stomach, gall, and urinary bladder. Where the pain is of less severity, life is prolonged to a greater extent than when it is more acute: overwhelming pain certainly hastens on that depression of the vital powers which constitutes '*shock*.'

The degree and variety of pain will depend very much upon the constitution and temperament of the individual, and the part injured. As a rule, in those cases when the mutilation is great from the injury received, not much pain is present, the '*shock*:' is such as to deaden the sensibility of the nervous system; but when the pain is excruciating, the

slightest *shock* may prove fatal. Sir A. Cooper gives, in his Lectures, a case of a man of middle age, of a powerful frame, who was suffering from Thecal Abscess, which was opened by an incision, and who immediately afterwards expired. The effects of acute pain upon the system may be such as at once to stagnate the vital functions by the terrific shock which has been given.

There is a peculiar kind of excitability which is possessed more or less by every individual, and which is acted on in a greater or less degree by external impressions. Some persons are more susceptible than others, and a very trifling injury inflicted under circumstances which at times produce great alarm will act with great severity on the nervous system, in consequence of the individual being of an excitable or nervous temperament, producing an infinite variety of effects; sometimes a general collapse, which threatens the speedy dissolution of the patient. If a person of this excitable, nervous, temperament should receive an injury, the impression upon the nervous system is most severe and lasting; thus it is that 'shock' tells with such terrible force upon some individuals. They become senseless, and collapse quickly follows, and yet the whole of the animal system may be in a normal condition. Any surgeon of experience will be able to tell us, how very differently persons bear an operation. One will refuse

chloroform, and undergo a painful operation with a most stoical indifference, whilst another will be half dead with fear, and exhibit an intolerance of pain which is truly appalling. This constitutional peculiarity is well known, and it has an important bearing with regard to injuries of the nervous system, and will have a remarkable influence over the success or failure of an operation. As an illustration I shall offer no apology for introducing the following cases which are recorded by Mr. Guthrie.*

‘At the storming of Ciudad Rodrigo I amputated a thigh in a convent close to the beach, within half-an-hour after the accident, by the anxious desire of the patient, the leg having been destroyed by the explosion of a shell. There was not more than the usual loss of blood, or of delay in the performance of it; my patient did not, however, recover the shock of the operation, and at daylight I found him dead, without the bandage being stained with blood. At the battle of Salamanca I had two men brought to me during the action. One had his arm carried away close to the shoulder, and his breast considerably grazed by a cannon-shot, the other had the greatest part of the leg torn away close to the knee: this was about four in the afternoon. They were

* Guthrie on Gun-Shot Wounds, p. 217.

laid in a ditch, without any covering, and a very small quantity of rum-and-water was given them during the night. . . . At daylight, five in the morning, the whole of the seat of the injury was removed, leaving only a clean incised wound, the greater part of which healed by the first intention, with little comparative fever or constitutional derangement.'

The above cases are unique in themselves, and show well this peculiarity of the nervous system, under two opposite circumstances. The fact that operations for some chronic diseases will occasionally produce most powerful effects, so as even to suspend the animal functions which are necessary for the maintenance of life, is undeniable; but *why* this should be so, is not easily explained. There can be no question but that a state of alarm, arising from some violent occurrence, such as a sudden smash of a railway train in consequence of coming in contact with some obstruction on the line, will have a most powerful effect upon the nervous system, modified or increased according to the peculiar idiosyncrasy of the person injured. I have witnessed persons after very trifling injuries, received from the overturning of a gig, in consequence of the horse becoming unmanageable, at once break down; and the normal functions have become suspended by the fright and shock they have received. A violent stroke of the brain given under circumstances of great terror, I

have seen produce total insensibility, which has, after a time, been relieved by vomiting, and then violent re-action, has set in. A lady, in my presence, accidentally ran a needle into her finger, and having a barbed point it could not be withdrawn from the finger which it had deeply penetrated; the lady expressed great alarm, turned deadly pale, and became insensible; the pulse was feeble and irregular, respiration was so gentle, that it was almost impossible to say the person breathed; the extremities became cold, and perspiration stood upon the face, and the action of the heart was nearly suspended. I laid the patient upon a bed, and lost no time in pushing the needle through the finger—cutting off the barbed point—and then readily withdrew the needle from the finger. During this time not the slightest evidence of pain was given by the patient, who lay the whole of the time in a state of insensibility. I never saw so powerful and depressing an effect produced on the nervous system from such a slight cause. The shock was unusually severe, and upwards of three hours elapsed before she had recovered from its effects. I do not think that the general effect on the system could be attributed solely to the shock received, but to the influence the injury had on the nervous system. Every accident or fright which stirs up the nervous system in an abnormal degree, produces an amount of irritation, which is proportionate to the injury

received, and if the shock does not prove *fatal*, still the re-action will not be of that favourable character which is necessary for the restoration of the injured parts. It must be distinctly understood that I am alluding to that condition of the nervous system when no vital organ is injured, and when the prostration is so great as to make us look upon the case as almost hopeless. Sir A. Cooper says: * ‘When a part of the body receives an injury, the nerves convey a knowledge of it to the important organs, as the spinal marrow, brain, heart, stomach, &c. Nature immediately commences the restorative process by stopping all the customary secretions; the various outlets being thus closed, the blood collects in quantities in the heart and large vessels which propel it with unusual force to the injured part, giving rise to inflammation in whatever form can best accomplish the desired effect. This is an illustration of the manner in which Nature contends for a cure, &c.’ Many there are, however, who never rally sufficiently from the shock produced on the system, to enable the necessary inflammation to commence for the due reparation of the injured part. It is a remarkable fact, that if the shock of injury is of undue severity, volition becomes suspended, and this condition of the system is followed by great exhaustion,

* Sir A. Cooper’s Lectures on Surgery.

with a strong tendency to sleep. There is a marked sympathy betwixt the spinal cord and brain and the heart, and any injuries to the former exercise a powerful influence on the latter. This particular sympathy between them is due to the intimate connection established through the medium of the great sympathetic nerve. The sickness and embarrassed breathing occasionally accompanying shock, is also accounted for by the intimate relation of the *par vagum* with the lungs and stomach.

Shock may be conveniently arranged under two classes, viz.: *shock* following surgical operations and injuries, and *shock* arising from MENTAL CAUSES. It is, however, in the former that we are more immediately interested, and which really is the object of this treatise, and we shall therefore only incidentally allude to the latter.

SYMPTOMS OF SHOCK.

THESE vary in a remarkable manner, with regard both to duration and degree, in proportion to the severity of the *shock* the brain may have received. Should it arise from a severe injury, such as that inflicted by a gun-shot wound which carries away a limb, or the greater portion of it, a deathlike paleness will steal over the countenance, followed by sickness and vomiting, which are the earliest symptoms of *severe shock*, and afterwards succeeded by an abundant perspiration, and the whole frame becomes shaken by an universal tremor, which is truly alarming. The pulse is small, feeble, and slow, the patient is perfectly senseless, and the respiration scarcely perceptible. The voluntary muscles become powerless, the urine and frequently the fæces escape. Should this condition of the patient be prolonged, we may be assured that the injury is of a most serious character. The pulse becomes more and more feeble, irregular, and intermitting, the extremities become cold. A cold perspiration hangs upon the face, no re-action takes place: the heart, losing its

natural nervous stimulant, soon ceases to act, and the patient expires.

The above are the leading symptoms of *shock*, which are more or less modified, according to the severity of injury; syncope will occasionally occur after but slight injuries, and the patient soon rallies; if, however, it follows severe injury, it is a most dangerous symptom, as it denotes that the *shock* is powerful and permanent.

Convulsions may follow *shock*, and we need not be surprised at this when we remember the intimate connection of the brain and nerves with the whole of the muscular structure, the least injury of a muscle or nerve sometimes producing violent convulsions, as in small punctured wounds. *Hiccup* will occasionally happen, and prove very distressing, and is doubtless caused, like that of vomiting, by excessive nervous prostration.

Delirium is sometimes another concomitant of shock, depending upon the circulation of the blood through the brain, as it is well known to be the effect of too quick or too slow a circulation through that organ.

There are necessarily many peculiarities attending the symptoms of shock, depending upon the nature of the injury, and the power of the nervous resistance in the individual. Hunter says: 'I have seen a man die upon the loss of a testicle. I have seen con-

vulsions attend the operation for hydrocele ; I have seen delirium and death follow in consequence of dividing parts in the leg. The loss of a limb is more than many can bear.* Hennen† relates instances of ‘men who have had a limb carried off by a cannon ball, without showing the least alarm or agitation ; others, again, will become deadly pale, have vomiting, profuse perspiration, and tremor.’

When the injury is slight, the symptoms of shock may be much modified ; the patient may be slightly stunned, or confused ; the prostration is less, and the *shock* less intense, so that re-action soon follows.

There is no question but that the irritation of any particular part will occasionally disturb the whole nervous system, especially when caused by some sudden occurrence.

In describing the symptoms of *shock*, I think it desirable to give in detail several cases which have fallen under my own observation, and which made a great impression on my mind at the time ; in fact, this treatise would not have been attempted had I not taken ample notes of these cases when they occurred, and which have furnished me with valuable material.

A man aged 28 years was at work in his garden, when he heard the report of a gun, and was imme-

* Hunter on the Blood, vol. ii. p. 210.

† Hennen's Military Surgery, 3rd edit. p. 33.

diately struck upon the right temple. He fell senseless upon the ground, and it was thought he was dead; I saw him within ten minutes after. The *shock* was considerable, and his symptoms were alarming; the projectile had divided the scalp for at least two inches down to the bone, and passed off without injuring the skull; re-action followed in about an hour, and in a few days he was quite well. *Guthrie** gives the case of a soldier who had a fall from his horse: he complained only of the shock he had received, not of any particular blow or injury, and declared he should soon be well again. He however sank, and died without a groan; on examination after death, the liver was found ruptured in two places.

John Perkins, æt. 18 years, had suffered for the past two years from scrofulous disease of the ankle-joint, which at last necessitated removal of the leg below the knee. I amputated the leg by an anterior and posterior flap. The operation was quickly done and very little blood was lost. Whilst sawing the bone, my attention was called to the patient by a gentleman that was assisting me; his head had fallen back, the mouth was open, the face deadly pale, so were also the hands, and foot of the sound limb; the pulse could not be felt, the action of the

* *Guthrie on Wounds and Injuries, &c.* p. 6.

heart was scarcely perceptible. After a few moments, convulsive heaving of the chest took place, and after three or four attempts the contents of the stomach were ejected; a cold perspiration quickly covered the face, the urine escaped, and this was followed by a kind of rigor or shaking of the whole frame; the nails on the fingers and toes had a peculiar blue appearance, which contrasted most ghastly with the deadly white condition of the adjacent skin: to all appearance the boy was dead. I secured, as quickly as possible, the arteries, there was not the slightest oozing of venous blood; I had the boy placed in bed, and left the wound open for a time. The surface of the body was remarkably cold when touched. I was quite unprepared for such an attack, inasmuch as the youth had expressed to me his satisfaction at the thought of being quickly relieved of his painful limb, and was determined to undergo the operation without, as he said, 'wincing,' and he did not evince the least alarm before the commencement of the operation. I looked upon the case as one of genuine *shock* following operation, as the above symptoms, which I have minutely detailed, clearly indicated. He had worked himself up to undergo any amount of torture that might be supposed to be inflicted by so severe an operation; but the brain was unequal to the task, it was tried beyond its power of endurance, and a sudden collapse of the whole nervous system took

place, the heart's action became enfeebled, and the train of symptoms detailed quickly followed. He lay unconscious for six hours before he rallied sufficiently to understand what was said to him; he then complained of a 'ringing in the ears,' and 'dimness of sight;' the mouth was dry and clammy, and when I brought the wound together with sutures, he did not feel the least pain; stimulants had been very cautiously given, a grain of morphia administered, and warmth applied to the surface of the body. He slept well the night after the operation, and the next day was but little the worse for the great *shock* he had sustained. I never witnessed so complete a case of nervous prostration; the boy ultimately did well, and is now living, and occupied as a schoolmaster in a small village near me.

John Sharpe, æt. 75 years, of Crowland, a patient of Mr. Trowell, of the same place, was the subject of strangulated *oblique inguinal hernia*. I was called in to operate, and did so under very favourable circumstances, relieving the stricture and returning the bowel. Before his removal from the table to the bed, he turned faint and deadly pale, the extremities cold, he vomited freely, which smelt very strongly of brandy, which he had taken before the operation, as he said to '*keep his pluck up*,' perspiration stood upon his forehead, urine escaped, and to all appearance he was dying. He was placed in bed,

warmth by means of hot-water bottles applied, an opiate given, also chloric ether, and compound tincture of lavender; the heart's action became slower and slower, the surface of the body colder, and he expired eight hours after the operation, without the slightest sign of re-action. This is a remarkable case of death from *shock* following a surgical operation. I was informed that he had been a hale old man, free from anything like organic disease, and was in every respect in a very favourable condition for undergoing such an operation. In neither of these cases was chloroform administered.

On September 17, 1843, I was called to Henry Taylor, æt. 16 years, a bricklayer. He had quarrelled with his fellow-labourer, who threw his trowel at him, the point of which penetrated the back between the eleventh and twelfth ribs, near the spine, making a wound two inches in length, through which a small portion of bowel protruded; when struck, he fell senseless upon the floor. I saw him a quarter of an hour after the accident; he lay insensible upon a bed, he had vomited upon it, he was cold and pale, the perspiration standing in drops upon his forehead, urine and fæces had been passed involuntarily, the pulse was feeble and the heart's action could scarcely be felt, the breathing was slow and unembarrassed, a considerable quantity of blood had escaped from the wound into his trowsers.

Shortly after I saw him, a quivering of the whole body took place as if he were cold. I pushed back with my finger the protruding intestine and strapped up the wound with soap-plaister; no bleeding had taken place since I saw him. I administered forty drops of laudanum, and applied warmth to the body; after two hours thirty drops more were given, and four hours after the accident slight re-action took place, a general warmth came over the whole body, and six hours after the injury he had rallied and was able to talk. The boy had not a bad symptom afterwards, and was well and about his work at the end of three weeks. This case at first was very perplexing, from the general collapse, and suddenness of its occurrence; I suspected internal hæmorrhage or wound of the intestine, and gave a very unfavourable diagnosis. His recovery, however, was marvellously rapid, after such grave symptoms, which undoubtedly were due to the *shock* given to the nervous system from the injury inflicted.

Mary Coxwell, æt. 57 years, on December 23, 1856, was assisting a man to *feed* a thrashing machine, when her left foot was accidentally drawn between the beaters of the machine, which completely pounded it up to the knee joint, laying the latter open and exposing the articulating surfaces of the condyles of the femur. She resided six miles from me, and two hours had elapsed before I saw

her. I found her lying upon a bed on the floor of the farm-house at which she was working; a considerable quantity of blood had been lost, she uttered a shriek at the time of the accident, became insensible, and had not spoken since. She turned deadly pale, and soon after she was carried into the house had vomited freely; a small quantity of brandy had been given her, but deglutition was very difficult. I found her pale, and her extremities very cold; perspiration upon her face and body. Almost pulseless. The heart very feeble in its efforts to circulate the blood; in fact the general collapse was something frightful; amputation of the thigh at its lower third was imperative. I deemed it prudent to wait until re-action had in some degree commenced. I administered a grain of hydrochlorate of morphia, and by perseverance got down a cup of milk and forty drops of compound spirits of ammonia; nearly three hours passed before signs of sensibility showed themselves, the pulse 98 in the minute—the action of the heart stronger. I explained to her that it was necessary to amputate the thigh. She expressed her willingness to have it done, and wished I ‘*would be quick.*’ I removed the limb by the flap operation, anterior and posterior, and secured the arteries. I do not think one ounce of blood was lost during the operation; strapped up the stump, and placed her comfortably in bed; applied hot-water bottles to the

foot and sides of the body, and repeated the grain of morphia. Two hours afterwards she fell into a deep sleep, which lasted over four hours; when she woke up she wondered where she was, and expressed herself '*free from pain and comfortable*;' she had but little recollection of what had taken place, or what had been done since the accident happened. Re-action gradually came on, and in the evening of the second day the pulse had run up to 130. The face was flushed, and the skin hot and dry; ordered her to have a saline with half a drachm of the tincture of henbane every four hours, and a grain of morphia at bed-time. Slept well during the night, very feverish, pulse 140, tongue dry, no pain. Under this treatment, she gradually recovered; the stump healed favourably, and at the end of seven weeks was quite well. With regard to the plan of treatment adopted, I shall reserve my remarks until I come to the general treatment of *shock*.

The above cases well illustrate the symptoms of shock occurring 'after surgical operations and injuries,' and the only case that I have seen terminate fatally after surgical operation is that of John Sharp, after the operation for relief of strangulated oblique inguinal hernia. The man had been subject to no particular treatment, except the hot bath and moderate attempts at reduction, and his death could not be attributed to any other cause but that of

great nervous prostration immediately following the operation.

DIAGNOSIS.

There will not be much difficulty in attempting the formation of a correct diagnosis. In shock, we find the body cold, pulse small and regular, vomiting, breathing easy, mental alarm and anxiety; in a greater or less degree, there is general collapse of the whole of the nervous system. It must not be forgotten that extravasation may supervene when the brain is the part more immediately implicated, and when lesion of its substance has taken place. This, however, will readily be distinguished by the hard, irregular, intermitting pulse, difficult breathing, dilated pupils, and the absence of vomiting. Sometimes *shock* and compression are so mixed up with each other as to make it extremely difficult to decide to which condition the symptoms are to be assigned.

PROGNOSIS.

With regard to this we must be very guarded. Of course, we must be guided in great measure by the nature of the injury producing the shock and the several complications with which it is liable to be mixed up. When the symptoms are not very severe, and re-action takes place early, a favourable opinion

may be given ; but when the state of collapse is prolonged, and delirium or stupor occurs, we may be prepared for an unfavourable result.

When the constitutional alarm or shock continues, it warns us of serious injury, notwithstanding the wound or injury producing it may not involve any vital part.

SHOCK FROM RAILWAY INJURIES.

BRINGING actions against railway directors for the slightest personal injury sustained in a railway accident has become of late very prevalent, and this is owing unquestionably to the prominent manner in which injuries of the nervous system, caused by railway accidents, have been thrust before the public under the startling announcements of ‘Railway Accidents or Collisions; their Effects upon the Nervous System,’ ‘On Railway Injuries.’ These writers have evidently given an unfair bias in favour of more injuries to the nervous system arising from railway collisions, than from any other cause. The nervous system is not more susceptible of railway injuries than of any other mode of injury; and to apply the terms *railway spine, concussion from railway shock, early symptoms of railway concussion, detail of symptoms of railway concussion, pathology of railway concussion*, is most reprehensible, and has given rise to actions for compensation for alleged injuries of the nervous system of the most ridiculous and frivolous nature. No other symptoms or

pathological conditions present themselves, than those arising from ordinary violence to the nervous system, and to introduce the word *railway* in such a prominent manner is, to say the least of it, unjustifiable. That I am not singular in this opinion is evident from the manner in which the subject has been noticed by the editor of the British Medical Journal,* also by that eminent surgeon, Professor Syme.† The former says: ‘Mr. Erichsen, in a recent publication, gives an account of injuries of the spine illustrated by cases. We must, however, object to the special character of the book, and as it seems to us given most needlessly and incorrectly. . . The title of Mr. Erichsen’s little volume is calculated to mislead the casual reader. The book really contains an account only of the effects of shocks and concussion of the spinal cord and brain; whereas “railway injuries” embrace a very wide field of surgical considerations, indeed almost every injury that blows and shocks can effect on the human body. Mr. Erichsen himself in fact shows throughout the book that there is really no difference whatever in the symptoms and pathology of the nervous injuries of which he treats, whether produced by railway or any other concussions. . It is therefore quite superfluous to make of them a special

* British Medical Journal, 1866, p. 612.

† On Compensation for Railway Injuries. By J. Syme, F.R.S.E. Lancet, 1867, p. 2.

class of railway nervous injuries. The fact is, that of the fourteen cases observed by Mr. Erichsen himself, and here detailed, no less than eight are not railway accidents at all, . . . however, the subject under the heading of pathology of railway concussions, consists almost entirely of references to the researches of Ollivier, Portal, and Abercrombie. In those works, we need hardly say, not a word is to be found about "railway concussions."

'From all this we gather that injuries of the nervous system, whether produced by railway or any other kind of concussion, resemble each other in every particular. It therefore seems to us that it would be just as reasonable to speak of railway fractures, or railway amputations, &c., as to speak of "railway nervous injuries." The only differences which, as far as we can see, are to be found between railway and other injuries, are purely incidental, and relate to their legal aspect. A man whose spine is concussed on a railway brings an action against the company, and does or does not get heavy damages. A man who falls from an apple tree and concusses his spine, has—worse luck for him—no railway to bring an action against. Surely the concussions of the spine, as such, are precisely similar, whether produced by a tumble off a ladder or a jumble in a railway train which has come to grief. It would be, in fact, just as reasonable to call a broken leg caused by the

kick of a horse an equine fracture of the tibia, as to call such a concussion of the spine a railway concussion. We object seriously to such specialising of "railway injuries." No doubt the public may readily be brought to believe that there is a speciality in the injuries produced by railway accidents, and, therefore that one surgeon has more special knowledge of their surgery than other surgeons have. This, it is true, may lead to the benefit of the individual, but clearly is not to the benefit of the profession at large, or of the art of medicine and surgery. The belief, on the part of the public, in the existence of such individual superiority, in the present case, at least, would clearly be based upon a delusion, and must necessarily tend to the unfair depreciation of general surgery, and of surgeons in general.'

I have made this lengthy quotation from the leading article of the 'British Medical Journal,' (all honour to the man who wrote it,) inasmuch as it so forcibly and clearly gives my views of the subject. It is very evident that Mr. Erichsen himself did not sit very easy under the above candid and honest criticism of his 'Railway Injuries,' as we find him addressing the following letter to the editor; and as it (together with the editor's remarks) bears so immediately upon the subject, I am sure no apology is needed from me for the insertion of the whole in this treatise:—

To the Editor of the 'British Medical Journal.'

SIR,—In the last number of the 'British Medical Journal,' you do me the honour to devote a leading article to a criticism on a small work recently published by me, 'On Railway and other Injuries of the Nervous System.' In that article you make two objections to the work: 1. to its title; and 2. to its alleged tendency to specialise railway accidents. With reference to the term 'railway injuries,' I beg to say that I have used it in the same sense that the term 'gun-shot injuries' is commonly employed by surgeons: not so much as denoting any specific difference in the nature of the injury, but rather as indicative of the peculiar and exceptional agency by which it has been occasioned. In this sense the terms 'railway injury,' or 'railway accident,' are commonly used in the ordinary hospital practice. A surgeon asks his house-surgeon 'Any fresh cases in to-day?' The answer is, 'Yes, sir; a bad railway case.' The house-surgeon would not say, 'A bad cab case,' or 'A bad horse case,' or 'A bad brick-bat case,' in the event of a patient having been admitted with a kick from a horse, or a crush from a wheel, or a blow from a brick. But he knows and recognises that there is a peculiarity about railway accidents that causes him to place them in a category by themselves; and he says, 'A bad railway accident,' just as he would 'A bad gun-shot wound.' With reference to the title on the cover of the book, I admit that the words 'Erichsen on Railway Injuries,' implies more than the book contains, and, so far, erroneous. But I must add that this particular title—the 'lettering,' as I believe it is called—was devised by the publisher and the bookbinder; was arranged with a view to space rather than to accuracy. With it I had nothing to do; and it was, I understand, adopted, because the small size of the

work would not admit anything more explanatory being placed on the outside. The second objection you make to these lectures, viz., that they tend to specialise railway injuries, is refuted by almost every page of the book itself. Its whole aim is to show that, although railway injuries are peculiar in their cause, and in some of their effects, there is nothing special about them, and that they cannot in justice be taken out of the domain of general surgery. This is repeatedly stated most distinctly, and without the possibility of being misunderstood, throughout the work. Thus, at p. 10, I say: 'Do not for a moment suppose that these injuries are peculiar to, and are solely occasioned by accidents that may occur on railways. There never was a greater error.'

Again, at p. 46, the following passage occurs: 'I cannot too strongly press upon you the fact that there is in reality nothing special in railway injuries except in severity of the accident by which they are occasioned. They are peculiar in their severity; not different in their nature from injuries received in the ordinary accidents of civil life.' I could multiply these quotations, were it necessary to do so; but, if the above sentences do not express my opinion that railway injuries are not, and should not be, considered special, I am unable to put my meaning in clearer language. With the view of proving, most incontestably and conclusively, that there is nothing special in railway injuries, I have been at the pains to show by cases that had been published, and by opinions that had been expressed, many years before railways came into operation, that conditions of the nervous system resulting from accident, and in every respect resembling those that are now unhappily of such frequent occurrence from railway collisions, were well known to the profession. It was with this view that I related the case of Count de Lordat, made frequent refer-

ence to the writings of Bell, Olivier, and Abercrombie. If the public, to use your own words, 'Believe that there is a speciality in the injuries produced by railway accidents,' that is none of my doing. I have always, in my lectures, in my writings, and in my consultations on these cases, done my best to disprove such an idea; and the work which I recently published had for its leading objects the endeavour to show the fallacy of such a doctrine, and to prevent railway injuries from being looked upon as the special province of the 'railway surgeon.' Such a practice would doubtless be to the detriment of the profession at large, whether beneficial to the individual or not. But the attempt that I have made to bring these injuries within the general scope of ordinary surgery can scarcely be considered as one likely to have the same injurious effect upon the art of medicine and surgery.

I am, &c.,

JOHN ERICHSEN.

Our surgical readers will decide what resemblance there is in the way inferred by Mr. Erichsen between the term 'Gun-shot Injuries' and 'Railway and other Injuries of the Nervous System.' Gun-shot wounds are, it seems to us, of a special and peculiar character. The injuries inflicted by railroads are, as Mr. Erichsen himself admits, just like all other injuries. We cannot hold, with Mr. Erichsen, that an author is not responsible for the title on the outside cover of his book. At all events, Mr. Erichsen's admission on this point in the case of his own book, fully justifies our remark thereon. As to his assertion that the specialising of railway injuries is refuted by almost every page of the book, we must, in answer, refer back to our criticism. If there be nothing special about such injuries, why was the work entitled 'Railway and other Injuries of the Nervous

System'? Why does Mr. Erichsen say in his notice, that his 'object has been to describe certain forms of injury of the nervous system that commonly result from accident on railways, &c.'? Why does he say, that for various reasons 'these cases are justly to be considered as somewhat exceptional from ordinary accidents'? Why does he give headings, such as 'Pathology of Railway Concussion,' 'Symptoms of Railway Concussion,' 'Detail of Symptoms of Railway Concussion,' 'Early Symptoms of Railway Concussion,' 'Concussion from Railway Shock,' 'Railway Injury,' 'Railway Injuries Peculiar, but not Special'? Why was the qualifying term 'railway,' applied in these cases, if there were nothing specially 'railway' in them? As, however, Mr. Erichsen asserts that his 'whole aim was to show that there is nothing special about these accidents,' we, of course, accept his assertion. But, with the above facts before us, as they appear in the book, we cannot admit that our criticism was either unfair or uncalled for.—
EDITOR.*

Professor Syme also states,† 'Since the passing of Lord Campbell's Act, a most unjust piece of legislation as it has always seemed to me, which established the principle of regulating the amount of damages for personal injuries in accordance with the value of individuals to society and to their families, claims of this kind have become very frequent, under circumstances which seriously call for consideration. For instance, at this time last year, a trial took place at Guild Hall in the Court of Common Pleas on the

* British Medical Journal, 1866, p. 678.

† On Compensation for Railway Injuries. By J. Syme, Esq. F.R.S.E. Lancet, 1867, p. 2.

part of a commercial traveller, who prosecuted the Great Northern Railway Company for compensation on account of an injury alleged to have been sustained from a collision on their line. In this case Sir William Fergusson, Mr. Erichsen, and Dr. Russell Reynolds declared that there was organic disease in the spine, which in all probability would soon prove fatal; while on the other hand, Mr. Borlase Childs, Mr. Pollock, of St. George's Hospital, Mr. Cock, of Guy's Hospital, Dr. Risdon Bennett, of St. Thomas' Hospital, Dr. Dunsmure, President of the Edinburgh College of Surgeons, and myself, no less confidently expressed the conviction that there was no organic disease whatever, and no reason why the claimant should not enjoy good health. The jury, instead of the 12,000*l.* asked, gave 4,700*l.* damages, and before the end of many months the plaintiff, who had been rapidly recovering, admitted he was quite well, and still continues to be so. The truth is, that when juries find the medical evidence so conflicting, not being able to judge for themselves as to the merits of the case, they almost always decide in favour of the claimant, so that there is thus great encouragement afforded to unfounded or exaggerated demands for redress. Indeed, any man who travels by railway may easily obtain a competence by stumbling on the platform after the door of his carriage has been opened by a servant of the company, but before the

train has ceased to move. He has then merely to go to bed, call in a couple of sympathising doctors, diligently peruse Mr. Erichsen's lately published work on railway injuries, go into court on crutches, and give a doleful account of the distress experienced by his wife and children through his personal sufferings, which have resulted from the culpable negligence that allowed him to leave his seat prematurely. Who can doubt that, in such circumstances, the jury would give large damages? This system ought certainly to be put down; and as one means of doing so, I beg to suggest the publication of cases exhibiting an entire discrepancy between the medical evidence, in order that regard for professional character may tend to cheat the reckless advocacy of one-sided views. The results of such cases in regard to the claimants' speedy recovery of health would also be worthy of attention for the same purpose; and, having given one of these, I may add a case of medical diversity of opinion that has just occurred here. On April 27 last, a commercial traveller drove out in the evening to my residence in the neighbourhood of Edinburgh, and informed me that he had been shaken the night before in a railway collision near Berwick-on-Tweed. He had walked immediately afterwards a mile and a half to see Dr. Maclagan of Berwick, and having been assured by him that there was no local injury or occasion for confinement, had come on to Edinburgh. Finding that

there was no local complaint, I desired him to call next morning at my house in Rutland Street and tell me if he felt anything wrong. He accordingly did so, and then exhibiting the most perfect freedom in all his movements, without any sign of local injury, I concluded that if he felt any uneasiness it must be more mental than bodily. Having expressed my opinion to this effect, I was rather surprised by being asked to recommend a law agent, and, it is hardly necessary to say, declined to do so. On the same day, April 28, it appears that this person having procured an accomplished agent, applied to a surgeon of experience in cases like his own, who discovered that he had sustained a 'severe wrench of the spine and sacro-iliac synchondrosis;' the surgeon put him to bed, called in a trustworthy coadjutor, and visited his interesting patient at least once a day for months. On June 12, Dr. Dunsmure requested me to see the claimant, as he had now become. We found him lying upon a sofa, from which he rose and walked with vigour and flexibility of body. There was not the slightest swelling, discolouration, or rigidity of the spine; and, on the contrary, every appearance of good health, so far as we could judge from our own observation. On July 29, the trial being about to take place, the claimant desired to be examined by a commissioner; and his ordinary attendant having given a certificate, on 'soul and conscience,' that he

was unable to appear in the witness-box without serious injury to his health, I was requested, along with Dr. Dunsmure, to report as to this for the information of the court. We found the claimant laying, or rather lolling, on two chairs in a garden, to and from which he walked in leaving and returning to his room, which was up a stair on the drawing-room floor. He told us that he sat at his meals, and, on the whole, he had no appearance of bad health. We reported our opinion that he could safely appear in court, and the trial was ordered to proceed. But the claimant's legal advisers applied for delay. On December 14, Dr. Dunsmure and I were again requested to see the claimant, as the trial would take place on the 24th. We found that he was not at home, but after a little while, we saw him walking stoutly along the street from a public bathing establishment, which it appeared he had frequented for several months.

He walked up the stairs of his residence before me, and neither then nor afterwards, when more particularly examined, showed any sign of spinal or other disease. At the trial, after the plaintiff had been examined—seated in a chair, not being able to go into the witness-box!—his counsel agreed to accept 1000*l.*, instead of 3000*l.* which had been demanded. I deemed it unnecessary to offer any observation on this case, but would suggest the following questions :

1. Could anyone who had sustained a severe wrench of the spine and sacro-iliac synchondrosis immediately afterwards walk a mile and a half, or, on the two following days, travel sixty miles by railway, drive about in cabs, and make visits without local complaint? 2. Could serious disease of the spine, resulting from external violence, exist for eight months without presenting some sign of its presence in the patient's gait, flexibility of trunk, or general appearance?

That the claiming of compensation for alleged injuries of the nervous system has been very serious to Railway Companies must be admitted, when it is stated that the following sums were paid as compensation for personal injuries to passengers by railway companies in 1865. Caledonian, 12,849*l.*; Great Eastern, 21,996*l.*; Great Northern, 22,387*l.* (this sum also includes the amount paid for damage and loss of goods); Great Western, 40,061*l.*; Lincolnshire and Yorkshire, 24,708*l.*; London and North Western, 30,728*l.*; London and South Western, 25,000*l.* (includes also the amount paid for damages and loss of goods); London, Brighton, South Coast, 4,504*l.*; Manchester, Sheffield and Lincolnshire, 6,483*l.*; Midland, 25,958*l.*; North Eastern, 14,355*l.* (this sum also includes the amount paid for damages and loss of goods); North British, 4,621*l.*, and South Eastern, 70,726*l.*

The following cases have been publicly tried, or

alleged injuries to the nervous system from railway accidents. 'Hunt v. London and North Western Railway Company. 500*l.* were paid into court. Mr. Huddleston, Q.C., W. Griffiths and Mr. Young were for the plaintiff. Mr. Powell, Q.C., and M. H. James for the defendants. The trial took place at Stafford.

The plaintiff was a surgeon dentist. On the 2nd of September he had arrived at the Wolverhampton station in the ordinary train, and soon after the train had stopped, another train, coming in from Walsall, ran into the same station, and came into collision with the train in which plaintiff was seated. The plaintiff was very much hurt, and was carried home. Headache, vertigo, numbness of limbs, and impaired vision were among the symptoms, consequent as effects of the injury he had received. It was stated in evidence, that five or six months must elapse before he could so far recover as to attend to his business. Verdict for plaintiff, damages 850*l.*

Another case was tried at Stafford, Hannay v. the London and North Western Railway Company.

The Company admitted their negligence, and paid into court 350*l.* Defendant sued for heavier damages.

The plaintiff was a pawnbroker at Dudley, 45 years of age, married and having two children. The damages claimed were for loss of profits in his business, owing to his incapacity for work; for medical

charges; and for travelling expenses, incurred in obtaining change of air. The plaintiff described the injuries he had received as being very severe, and as having greatly impaired his powers of memory.

He detailed to the court one curious, *remarkable symptom*—namely, that he clearly recollected events that had occurred many years, twenty years ago, although he could now, very frequently, *not* recall events that had quite recently taken place. The medical evidence on both sides was very conflicting; Mr. Faraday and Dr. Bell Fletcher advancing the opinion that the plaintiff had received concussion of the brain and was in a great degree permanently incapacitated for his ordinary duties; whilst, on the part of the defendants, Mr. Pemberton, the medical officer of the railway company, and Mr. Heslop, considered the plaintiff, medically speaking, quite well. Damages were awarded to the amount of 550*l.* in favour of the plaintiff.

Mr. —, æt. 38 years, in 1855 was travelling in a train up to London on the — Railway. A collision occurred, and he was thrown forward upon the cushions of the opposite seat. He made no complaint at the time to his travelling companions of having received any injury, but went on to London, attended to his business transactions, and returned home in the evening a distance of one hundred miles. Three days afterwards he applied to his medical at-

tendant, and complained of numbness of the shoulder and down the arm to the elbow: he was informed that there was really nothing the matter, and that he was 'more frightened than hurt.' He said, however, that as other people claimed compensation for such injuries he should certainly do so; he never was laid up a single day, and was always about his business; he was insured in an 'Accidental Insurance Company,' gave notice to them of the accident, and compromised with them for *twenty pounds*; his surgeon suggested *twelve pounds*. He afterwards claimed, of the railway company, compensation for his injuries; his medical attendant advised him not to do so, but if he did, not to ask for more than 100*l*.

A surgeon visited him on behalf of the —— Railway Company, and when he called, Mr. —— was out shooting. Having been informed of a gentleman having come to examine him, he immediately returned, changed his dress, and received the surgeon upstairs. Three hundred pounds were offered and declined. A week afterwards he met his surgeon, and said 'It is a good thing I did not take your advice. I claimed 1,500*l*. and they offered me 500*l*. and costs, and I have taken it.' I hope it is needless to say that he has been quite well ever since the settlement. This is *one* of many such cases, which are continually occurring, and which never come to trial. It is a remarkable fact, that the complainants in these cases

of alleged injury to the nervous system, are always well up in the symptoms of spinal affections, and detail them in such a manner, and use such terms to describe their feelings, that I am at once convinced they have perused some surgical work on railway injuries.

One popular complaint is, that they have in a great measure lost the power of *copulation*, a very telling injury with an English jury, and one which invariably carries damages. In one case this defect was put prominently forward, when at the same time I knew the plaintiff had, since the accident and before compensation was awarded him, actually been brought before the magistrates and was accused by his servant maid of committing a criminal assault upon her and accomplishing his purpose. The case was dismissed, in consequence of the groom coming forward and stating that he had frequently had connection with her during the time she was in her master's service.

The following case was tried against a railway company last March. A young man was travelling in an excursion train which ran past the platform and came in contact with some coal waggons which were being shunted on to a siding. He was in a carriage next to the engine, with his back towards it. The plaintiff stated at the trial, that he was pitched first backwards and then forwards, his head was struck by the back of the carriage, and the lower part of his

back was struck against the seat ; he said that he did not move for some moments. Afterwards he left the carriage, and walked about to see what was the matter. He then continued on his journey to London by the same train. It further appeared that he had medical advice next morning.

After a few days he returned home, a distance of 160 miles from London. He had not any medical attendance at home, but went to London, to see his medical attendant, three or four times. His statements at the trial were, that he 'has been unable to attend to his work, feels done up, can walk about very poorly, can eat and sleep badly, has pain in the head and singing in the ears.' The plaintiff admitted at the trial, that he had frequently played at billiards after the accident ; and it was equally true that none of this man's neighbours were aware that he was at all ill, and expressed great astonishment when they learnt that he had brought an action against a railway company and claimed 1,500*l.* damages. I visited the man three months after the accident. I found his pulse 96 and regular, his respirations were free and 26 in the minute. I then asked him to strip ; he did so without assistance. I found his lungs were sound ; I examined his back and made percussions the whole length of the spine without his giving the slightest sign of pain or flinching. This I did quite heavily, and with con-

siderable force with a thimble, upon a percussion plate. Had his spine been really hurt he could not have borne this percussion. In order, however, to test what the plaintiff might say on knowing that I was examining his spine, I said, 'Now I am going to examine your spine, so tell me when it hurts you.' At the very first tap I gave him he called out, and at every subsequent attempt he said '*oh, don't, it hurts me,*' although, before, I had used the same means over the same spots without his evincing the slightest pain. I then asked him to walk from one end of the room to the other. He did so without the least hesitation, with a steady firm gait. I gave the following written opinion: 'That the plaintiff is not suffering, nor has he suffered, from any injury of the nervous system, and I am justified in coming to this conclusion from the fact of there being no physical evidence of such injury. I maintain, that if it were true that he has been unable to attend to his work, that he has ringing in the ears, and pain in the head, and that this has been so ever since the accident, there would certainly be some physical symptoms of such illness, whereas the plaintiff presented no appearance of ill health.'

Comment upon the above is unnecessary. I regret to say, that after the plaintiff's case had proceeded for some time a compromise was ultimately made, by consent of counsel, for the payment of about one-

third of the damages claimed, and I have not the slightest doubt that, had the matter been fully laid before a jury, very slight, if any, compensation would have been awarded.

I have selected this instance, inasmuch as it is typical of many such cases, which are constantly being brought against railway companies, and as a rule, heavy damages are sought. Numbers of these cases never come before the public at all, but are privately compensated, sooner than risk a trial by jury.

The consequence is that great imposition is practised against railway companies, who have had but little opportunity of defending themselves against such cruel and unjust claims, with anything like a fair chance of success. And how is this? how has it arisen? With shame do I confess that the surgical profession is much to blame in this matter; an unfair degree of prominence has been given to injuries arising from railway accidents or collisions. The public are becoming as familiar as 'household words' are to themselves with the symptoms of spinal disease, and when giving their evidence evince a remarkable knowledge of physiological and pathological terms.

In answer to a letter of mine on this subject, Dr. Cooper, the surgeon to the Great Western Railway Company, states:—'Some of the more interesting cases have been those which have not gone to

trial at all, and would be well worth personal investigation to upset the "concussion of spine" absurdities, which are most monstrous. Singularly enough, they gloriously mix up the spine with its ligaments and the spinal column together, in their ignorance on the subject; the fact being, that in real injury or disease of spinal marrow itself or coverings, there is very little or no pain at all, and if so, not for a very long period, and other most unmistakable symptoms have commenced: certainly no acute pain; if any, a dull heavy pain. All this I should be happy to assist you in, if I am able. Not long ago I had the opportunity of proving this, by the post mortem examination of one of these cases, which happened to die of bronchitis, when not an atom of injury was found in the spinal column. Injuries to spine, as promulgated in courts of law, are a very different disease to that taught in the schools of anatomy and physiology, and are always cured by *golden blisters*.'

It is only shock to, and alleged injury of the nervous system, which I wish particularly to treat of in this chapter, inasmuch as they form now a class of injuries which designing and unscrupulous people do not hesitate to take shelter under for the purpose of exacting, through legal or other channels, compensation for such simulated injuries. It is notorious—and to the credit of railway companies do I write it—that in all cases of real and unmistakable injuries

arising from accidents upon their lines, either from unavoidable circumstances, or from neglect on the part of the companies' servants, the parties injured have met with a liberality and sympathy from railway directors which have no parallel, either in the government establishments or private companies. It behoves, therefore, the medical profession, who have in a great measure the control of these cases, to protect railway directors from imposition, as far as they can, and wherever there is a doubtful or suspicious case, immediately to call to their aid additional medical assistance, and at once discountenance, resist, and expose all attempts at simulating nervous diseases. That I am not unnecessarily calling attention to this subject may be believed from the fact that so many actions have been, and are every session, tried in our courts of law for alleged injuries of the nervous system, where the symptoms have been entirely of a subjective nature, and which are most difficult to refute. In fact, this can only be done by narrowly watching the patients' movements, and general conduct, during the time of a professional examination, and observing how far they may accord with the usual symptoms presented when actual injury of the part complained of has taken place. I must admit, that when persons are simulating nervous diseases it is a most difficult thing for the surgeon successfully to expose them.

The phenomena that follow injuries of the nervous system are so varied, and so uncertain in their effects, that a cunning and unscrupulous person will comport himself in such a way as effectually to baffle the surgeon in his honest endeavour to form a correct diagnosis. These cases, and they are *legion*, can only be met by a visit being demanded and made on behalf of the railway company by some surgeon of experience, and afterwards an espionage kept over them until the trial takes place; so that their movements and conduct may be so noted, as to enable us to say they are diametrically opposed to all known and acknowledged symptoms arising from actual injury of the part complained of. In all such cases there must be a bold and firm resistance on the part of railway directors, and not a too ready acquiescence in complying with the demands made for compensation for these nervous injuries; but it must be made known that in no such cases will money be paid, except by the direction of a jury. Such a course will tend more to prevent these frivolous and simulated cases being urged against railway companies than any other that could be adopted. Privately to compensate such cases is highly injudicious, and doubtless encourages others to bring forward such claims under similar circumstances.

This class of cases does not always succeed with a jury, as the following instance will show. In February

1867, an action was brought against the ——— Railway Company, to recover ‘compensation in damages for personal injuries received,’ through the alleged negligence of the defendants’ servants. The evidence, both medical and otherwise, was, as is usual in these cases, very conflicting. The jury were locked up for some time, and being unable to agree, were discharged. Again, an action was brought against the ——— Railway Company, for bodily injuries sustained by an accident on the defendants’ railway. Evidence was given at the trial, to the effect that the plaintiff had previously been a very active and healthy man, and that he was fond of scientific pursuits, but that since the accident, his *nervous system* had become so seriously affected, that he no longer took delight in any of the amusements in which he had before indulged ; that his memory was bad, and he could not attend to his business. The trial took place at ———, before a special jury ; a verdict was found for the plaintiff, and damages to the amount of several thousand pounds were awarded. Afterwards a rule was obtained for a new trial, on the ground that the damages were excessive. The court said they were of opinion that the damages were excessive, and suggested that they should be considerably reduced. The plaintiff’s counsel submitted, that the damages were not more than sufficient to compensate for the serious injuries he had sustained, and his great sufferings. Their

lordships were asked to allow the plaintiff costs as between attorney and client, as the expenses of the action had been heavy.

Mr. Baron Martin.—Certainly not. I will never advise anyone to agree to any costs as between attorney and client, as it is impossible to know what they are.

The parties then agreed to the damages being reduced, and on that understanding the rule was discharged.

Mr. Baron Martin said the plaintiff might go further and fare worse.

TREATMENT OF SHOCK.

ON the treatment, or rather management, of *shock*, it is now my duty to enter. The latter term being by far the most appropriate, Mr. Paget * says: 'But from whatever source an intense shock may come, there is perhaps no case in the management of which the courage to do little is more needed. Great energy of treatment may do great mischief.'

I quite coincide with Mr. Paget in this, for there is a re-action which follows shock, which may be productive of much inconvenience to the patient, and this fact in the treatment of shock we must not lose sight of.

Sir Astley Cooper † states that 'injuries producing fatal consequences destroy life in different modes. When severe they destroy by occasioning excess of action; the most severe, by shock to the nervous system, cause death without re-action.' Some cases never reach the stage of re-action, in consequence of

* Address on Surgery, British Medical Journal, 1862, p. 157.

† Sir A. Cooper's Lectures on Surgery.

the severity of the shock the system has had ; and prove fatal as soon as re-action has commenced, from inability to sustain it.

When the re-action takes place, it will be in proportion to the severity of the great collapse which has preceded it; if the *shock* has been slight, it will be followed by nothing more than that healthy re-action of the constitution, which is necessary for the true balancing of the disturbed nervous system ; if severe, re-action may assume very powerful febrile action, which may materially interfere with the healing of the wound, and, re-action, although it affects all parts more or less, will occasionally concentrate its evil effects upon the part operated upon or injured, and may assume that acute and inflammatory condition which leads to suppuration, or even to gangrene of the part. It is most difficult to treat the vomiting and retching of severe *shock* ; inasmuch as fluids are generally ejected immediately after they are taken, a small quantity of brandy-and-water, not more than a spoonful, should be given, and that not frequently. I have found opium, in combination with creasote, given in the form of pills, very useful, also effervescing draughts of citrate of potash ; mustard cataplasms should be applied to the pit of the stomach, bottles of hot water applied to the feet, and also placed against the sides of the body in bed ; flannels wrung out of hot water and

sprinkled over with spirits of turpentine, and applied upon the abdomen, have been found very efficacious. Should the vomiting be persistent, the turpentine epithem should be persevered in, and may also be applied along the spine. Warmth may also be applied by means of blankets. Dr. Copland* says, 'In all cases of a severe and dangerous nature, and where the occasion admits of having recourse to the means, the patient should be placed in a bed, previously well warmed; and two young persons, according to the sex which may be proper, ought to be placed close to him, one on each side, without any intervening covering. In some countries it has been customary to apply animal heat in a different way; namely, by the skins of animals, torn from their bodies instantly on their being killed, and the internal surface applied directly to the patient's body, or even the opened bodies of the animals themselves, whilst still warm. I have seen the means employed, and certainly with greater success than I expected. In cases of shock from blows or contusions on the abdomen, or near the epigastrium, these means are appropriate, and their success admits of rational explanation.' Opium, however, is the most valuable therapeutic agent we have in the management of the shock and re-action of surgical injuries; for it not

* Copland's Dictionary, p. 789.

only resuscitates the depressed nervous system, but balances and restores the circulation, soothes pain and thus exerts a most favourable influence upon the patient; the very fact of the system being prostrated by shock, or exhausting pain from injury, or loss of blood, renders the necessary tolerance of opium, and we can administer the drug in large doses with the best effects, especially when we find it necessary to give large and repeated doses to mitigate great pain. A grain, or even two grains, of opium may be given in the form of a pill, and repeated four hours afterwards, if the symptoms are such as to need it; but the stomach will sometimes throw up the pill, unaltered, soon after it has been swallowed. Should such be the case, from two to three drachms of laudanum should be given as an enema, and repeated when necessary; in whatever way it may be found advisable to administer opium, it is only in full and repeated doses that it will have the effect of controlling the nervous system. When once it has effected this, its administration will be productive of much benefit to the afflicted sufferer. When the patient is fully under its influence there is a calmness which steals over the whole nervous system, subduing and tranquillising the alarm and excitement of the patient, which it is also our duty to try and allay, by cheerful conversation and encouragement. When this effect is produced, the opium may be discontinued, and three to five grains

of the extract of henbane given every four or six hours; food must be given very sparingly and that of a mild unstimulating kind, and not too frequently, for in the collapse which attends shock, we have to contend with a most distressing sickness, which may be greatly aggravated by the injudicious giving of food. To a certain extent I look upon sickness as having a beneficial effect; the very action of it tends to rouse up the prostrated patient and hasten on the stage of re-action; there can be no question but that the effort of nature to relieve herself by vomiting, forces the blood through the brain, and thus assists in restoring the vital powers, so that volition for a short time may be induced even in those cases that may, after a few hours, terminate fatally. Of course, when there is a tendency to extravasation of blood in the brain, from rupture of a vessel, caused by the injury, vomiting would, under the circumstances, be very injurious.

Whilst upon the subject of sickness I am naturally led to speak of that valuable anæsthetic, chloroform, which frequently produces a most uncontrollable sickness for some time after its administration, and when shock follows an operation after its use, it certainly aggravates the sickness, and thereby increases the danger and shock of an operation. I very reluctantly record this slight objection to one of the most valuable agents ever introduced for the purpose

of lessening the pain attending surgical operations. This, however, I consider counterbalanced by the fact of its placing a patient in the most favourable condition for undergoing a painful operation, robbing it of its terrors, and rendering him less liable to the *shock* which we are so anxious to avert. Chloroform is now better understood, great care is taken in its administration, the patient is well prepared by a slight dietary a few hours previous to its use, and it has thus become less provocative of sickness than formerly. In fact *shock* will become less frequent after surgical operations, under its administration.

Pain is a great incitement to '*shock*.' Pain of an unremitting and extreme character will of itself produce fatal results, and any plan of treatment which will prevent or subdue it, is to be commended.

Mr. Paget* recommends the *subcutaneous injection of morphia after operation, before restoration of consciousness after chloroform*, with a view of inducing freedom from pain, and some refreshing sleep after a return to consciousness.

From a quarter to a third of a grain, or even half a grain of morphia may be employed, according to circumstances. I understand that this has been in use for some time past at the Middlesex Hospital, and has afforded much comfort, especially after im-

* Lancet, 1863, vol. i. p. 148.

portant and painful operations. There is a drawback even to this, as it will occasionally produce an amount of local irritation which it is as well to avoid near a large and recent wound, and it may be followed, as I have seen it, by a severe attack of erysipelas, involving the whole of the stump or injured part.

In managing that stage of *shock* in which we have prostration without re-action, we must be exceedingly careful not to overload the stomach. If sickness be not already present, the least indiscretion in the shape of food or stimulants will induce it.

‘Patent Corn Flour’ with milk is the most likely food to be retained, a teaspoonful of brandy having been added to every two tablespoonsful.

Hæmorrhage has a powerful effect upon the nervous system, and will occasionally, after gun-shot wounds, so reduce the patient as to place him in the worst possible condition for undergoing the shock of an operation. Our first duty is therefore clear enough: to arrest the bleeding and have recourse to diffusible stimuli, and to support by nutriment, such as arrow-root, yolk of egg, jelly &c.; to have a pure atmosphere, and to apply warm applications to the surface of the body.

The following case has just occurred in my practice. Mrs. Storr, æt. 27 years, was taken in labour of her second child, May 31st, 1866, at 9 P.M. Her pains

were most violent and forcing, and at 12 o'clock the child was born, and about ten minutes after the placenta was expelled; very little hæmorrhage took place, she was much excited and alarmed at the severity of her pains, and after the birth of her child was fearfully prostrated. At 1 A.M. June 1st, she had a sudden gush of blood from the uterus, which threw her into violent convulsions, and I was immediately sent for. I found her quite insensible and deadly pale, perspiration was standing in drops upon her face, she was pulseless, and had just vomited upon the bed some brandy-and-water that had been given her. The heart's action was very feeble, the extremities were cold, and to all appearance she was dead: her friends and attendants were much alarmed. Upon removing the bed-clothes, I observed a great quantity of blood upon the bed, the uterus was firmly contracted and all bleeding had ceased; the nurse informed me that the 'flooding came all at once;' the convulsions had nearly ceased when I arrived. I ordered hot-water bottles to the feet, had the hands rubbed, and gave her, with some little difficulty, a small quantity of liquid containing one grain of hydrochlorate of morphia. In about an hour's time the pulse could be distinctly felt and she became sensible and was able to speak; the collapse still was very great, and she lay in a state of semi-insensibility for more than six hours.

After four hours another grain of morphia was given, also a small cup of Patent Corn Flour and milk with two teaspoonsful of brandy ; about twelve hours from the occurrence of the hæmorrhage, re-action took place, the face became flushed, pulse quick, and she complained very much of 'throbbing pain' in the head, and feeling very giddy. An evaporating lotion was applied to the head ; an effervescing saline, with half-drachm doses of the tincture of henbane, were given every four hours, and within twenty-four hours of the attack, she had quite recovered from the great shock her nervous system had sustained.

Excessive re-action may supervene upon the stage of collapse, or it may be of a gradual and restorative character, such as that which follows an ordinary fit of fainting, or it may be of a most violent nature, which may suddenly lapse into exhaustion, and prove fatal ; should the re-action produce a state of great excitement about the brain, and delirium ensue, our object is to moderate it ; we must not hesitate to have the scalp shaved and spirit lotions applied, or ice placed in a bladder ; purgatives may be given of calomel and jalap, and if the sickness continues, a purgative enema must be administered ; an effervescing saline mixed with half-drachm doses of the tincture of henbane may be taken every four hours. We must remove all causes of excitement, and keep the patient as tranquil as possible by placing him in

a cool, quiet, darkened room; if the excitement be kept up by a mutilated or diseased limb which it is impossible to save, its immediate removal is imperative.

We must not forget the beneficial effects of opiate injections up the bowel, which have been known to have the effect of subduing the highest state of delirium; the mind becoming tranquillised, and calm and refreshing sleep following.

The most difficult form of *shock* to manage is that arising from injuries to the head, such as from a fall or blow: a sudden agitation of the brain may so interfere with its circulation as to suspend the powers of the mind, or the concussion may be so violent as to lacerate a portion of the brain; extravasation of blood takes place, and death is the consequence. It is of the uttermost importance that we should be able at once to distinguish between the two injuries, so as to be guided in our treatment. The following case came under my observation.—Jane Gowler, a labourer's wife, æt. 36 years, took her husband's breakfast to him about a mile from her home where he was at work: they had a few words, when he struck her a blow with his closed hand immediately behind the right ear; she fell insensible upon the ground; the man and his fellow labourers were much alarmed, they rubbed her hands, and 'tried all they could to bring her round.' After about

twenty minutes she spoke, complained of great pain in her head, and vomited her breakfast, which she had taken just before leaving home ; after a time she felt much better and walked home by herself, refusing assistance ; she complained to a neighbour of her husband's treatment, was again sick, and said her 'head hurt her very much ;' she said she had 'to go into the town' (about a quarter of a mile) 'to buy some shop things,' and then, if not better, would lie down ; about 4 P.M., the woman's neighbour became uneasy about her as she had not seen her since morning ; she went into her house, and, not seeing her, went upstairs, and found Gowler upon the bed, quite dead.

I was sent for, heard the above particulars, and expected some lesion of the brain. Upon examining the head I found the right middle meningeal artery torn and a considerable extravasation of blood. The man took his trial for manslaughter, and was sentenced to penal servitude for five years. The above case well illustrates *shock* following a blow upon the head, accompanied by lesion of an artery and hæmorrhage, and terminating fatally in about ten hours. In cases of simple *shock* to the brain, the great danger we have to apprehend and guard against is inflammation of the brain, and we must adopt all the known means of allaying excitement and keeping down the heart's action, which I have before detailed. When

all danger of inflammatory action is over, I know of nothing so useful as the shower bath for restoring the usual energy of the nervous system, and bringing the brain into its usual healthy and normal condition. The great difficulty in these cases is in distinguishing between simple *shock* and extravasation, inasmuch as the symptoms are similar, and there is but little time after the *shock*, before the graver symptoms of extravasation set in; time will develop the true nature of the case, and enable us to treat the patient judiciously. Whenever a rupture of a small vessel has taken place within the head, the *shock* which is produced by the injury certainly places the patient in the most favourable position for preventing the bleeding, and it behoves us to be very cautious how we stimulate the action of the heart by brandy or wine, or we shall encourage the extravasation of blood, and hasten more alarming symptoms by the excessive re-action produced by giving stimulants; we should rather prolong than diminish that period of *shock* or general collapse which immediately follows injuries of the brain.

When there is no need to fear extravasation of blood within the head, and the stage of re-action has set in, we must enjoin a low diet, have recourse to bleeding, purgatives, evaporating lotions to the head, blisters to the nape of the neck, in fact, all the usual appliances and medicines found most useful in arrest-

ing the tendency to inflammation ; sometimes, after *shock*, instead of the necessary re-action or inflammatory condition of the nervous system ensuing, the patient will fall into a low muttering or incoherent delirium, succeeded rapidly by coma ; when such is the case, we may be prepared for a fatal result.

When shock has followed immediately after a severe injury, which involves the necessity of removal of a limb, it becomes a question whether we should at once operate, so that the shock from the injury, and that produced by the operation may become continuous ; or should we wait until re-action has taken place ?

I have read of several deaths which have ensued upon amputation for recent injury, before recovery from the alarm and nervous depression ; others, again, think ‘the shock of the injury covers and identifies with itself that of the operation promptly performed.’* Again Guthrie † says : ‘the general result of my experience is decidedly in favour of allowing the first *moments* of agitation to pass over before anything be done, a period extending from that, to one, six, or eight hours, according to the difference of constitution and the different injuries that have been sustained. But from one to three hours will in most cases be found sufficient.’

* Travers on Irritation, 1827, p. 145.

† Guthrie on Gun-Shot Wounds, 1827, p. 234.

I believe that now, so far as shock is concerned, it is generally admitted, that to operate when the patient is faint, and prostrated by the alarm produced by the *shock* of the accident, would show a want of prudence and foresight on the part of the surgeon. Before submitting the patient to the trying ordeal of a severe operation, we must be guided in our decision by the state of nervous depression and collapse he may be in; for if he be greatly depressed by the shock of the injury, immediate amputation must not be performed, but re-action from the shock encouraged by the means which I have before stated. I am only treating of the propriety of amputating a limb so far as the treatment or management of shock is concerned, and which is unavoidably involved in and mixed up with it.

No fixed time can be laid down, as a rule, when the patient suffering from shock will be in a condition to bear an operation, for this of course will depend much on the powers of endurance and constitution of different persons. Some will suffer an immense amount of pain and injury without evincing alarm or nervous prostration, while others again will be immediately thrown into a state of nervous collapse, which may last for hours, causing the greatest anxiety on the part of the surgeon for the safety of his patient. Our duty is plain and simple enough—to rouse up the patient to a state of

consciousness, get rid of the general alarm, and restore the heart's action. A due consideration of all the circumstances connected with the phenomena of *shock* will not fail to guide the surgeon as to the time for surgical interference.

CONCLUDING REMARKS.

It is quite unnecessary, in fact it would be altogether foreign to the object of this essay, to recount the physiological experiments which have been conducted for the purpose of ascertaining the effect of injuries of the nervous system on the heart and circulation. But it has been recorded by *Le Gallois* and *Dr. Wilson Philip*, that when any violent or sudden injury has been produced, especially of the brain or spinal cord, a prostration or complete stoppage of the heart's action was the consequence, from which it was thought that a sudden *shock*, or concussion of the brain, suspended the heart's action, producing syncope and death, commencing at the heart.

The vitality of the heart appears to be completely annihilated, for, when examined immediately after death, contraction could not be excited. Mayo says: 'a great part of the brain of an animal may be gently and quietly sliced away with little or no effect; but if ever so small a portion be suddenly crushed, the heart stops directly.' Cole, in his 'Field Practice in India,' says: 'The English dragoon

sword is so blunt that the strongest man cannot drive it through the head-dress of the Sikh or Afghan, nevertheless the enemy is most often beaten from his horse, and frequently killed by the violence of the *shock*. Not so, however, with the trenchant blade of the Sikh. This weapon, wielded by a strong man, will cut through any head-piece, and bury itself perhaps in the brain, and yet you find no symptoms of concussion or compression. In the former example, the soldier is effectually disabled, often killed outright; in the latter, although the individual is mortally wounded, he may be able to continue the fight, and even to kill his antagonist before he falls himself, dead or dying, from his horse.'

Unquestionably, when shock proves fatal in the first instance, it is in consequence of failure of the heart's action. It is a remarkable fact, that in some cases the heart has been found empty, a condition which is not readily accounted for. In other instances it has been found distended, and there is a singular peculiarity in this fact; in the right and left sides the quantity of blood is the same: a pathological condition which is not present when death takes place from asphyxia.

I have tried the experiment several times by killing rabbits by drowning, and by a blow upon the head. In death from asphyxia it has taken place from *failure of respiration*. Sensibility being

destroyed, the lungs are no longer sensible to the stimulus of the venous blood, and there is also paralysis of the muscles of respiration. In such cases the right side of the heart, the pulmonary artery and its branches are found filled with venous blood, but the left side of the heart is quite empty.

When I have killed a rabbit by a violent blow on the back of the head, without producing fracture of the cranium, or any laceration or unnatural condition of the brain or its vessels or membranes, the functions of the brain have been suspended, and the sudden shock has interfered with the circulation of the blood through it. Although no appearance of injury may be detected, in the substance of the brain, by dissection, Sir B. Brodie is inclined to think that 'if the structure of the brain is on so minute a scale that our senses are incapable of detecting it, it is evident that there may be changes and alterations of structure which our senses are incapable of detecting.' Others, again, suppose that a fatal *shock* or suspension of the brain's function, may be produced by condensation of the brain. For instance, Mr. Liston states: 'When a blow is inflicted on the skull, only a slight commotion of the brain is induced, the cranial contents are, as it were slightly jumbled, and a temporary and trifling disturbance of its functions follows. When, however, the stroke is more severe, the brain is separated from its cranial attachment both at the

point struck, and at the point directly opposite; it is thrown upon itself, upon its centre, its substance is thereby condensed, its diameter in direction of the impulse diminished, and a separation between the brain and cranium is formed at each extremity of that diameter. By post mortem examinations it has been ascertained that condensation of the substance of the brain does exist in cases of severe concussion. Such condensation may be sufficient to cause instant extinction of life, or the brain may gradually resume its former condition, or with only such slight incited action as may be required to reunite the dura mater with the inner table of the skull.'

It has already been admitted that operations and injuries do occasionally produce fatal results, by a certain series of symptoms, which are evidently connected with the nervous system. In what manner, or on what principle, do they destroy life? That there is a powerful effect produced on the heart's action is undeniable, and we well know that the heart may be directly acted upon either as a sedative or stimulus, through the medium of the brain and nerves. The sudden withdrawal of that nervous influence is the cause of the loss of sensation and volition; the blood loses its power of stimulating the heart's action, and the air can no longer excite the lungs to perform their natural functions.

It is interesting to know if there is any essential

difference in the principal upon which death is produced by shock following simple concussion of the brain, and that caused by the severe mutilation of a limb. We fail, however, to discover any difference between the shock produced by functional disturbance of the brain and that following a violent injury when the brain has suffered no inconvenience whatever.

Shock, although caused by an injury at a distance from the brain, by its severity and diffusedness affects alike the great nervous centre and the entire nervous system; such is the effect of shock upon the vital functions produced by violent injuries.

The fatal progress and termination of a case of *shock* will depend upon the kind and severity of the injury producing it, and the degree to which the nervous system is affected by the sudden withdrawal of its nervous energy, which immediately acts as a powerful sedative upon the action of the heart itself.

It must be remembered that from whatever cause the function of an organ is suspended, the brain being the great centre of sympathy, its functions become immediately affected; and as it presides over and regulates all the vital functions, and is essential to the vascular system, it is impossible for one to be affected without seriously impairing the other.

We may therefore fairly draw the following deductions, viz. :—

First: That the phenomena of *shock* are produced

through the medium of the brain and nervous system, which are paralysed, whereby volition and sensation are temporarily suspended.

Secondly : That, from whatever cause *shock* may arise, whether from surgical operation or injury, the effect is the same.

Thirdly : That when *shock* causes death suddenly, the normal function of the brain and nervous system is completely annihilated, and the abrupt withdrawal of the nervous stimulus from the heart instantly arrests its action.

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